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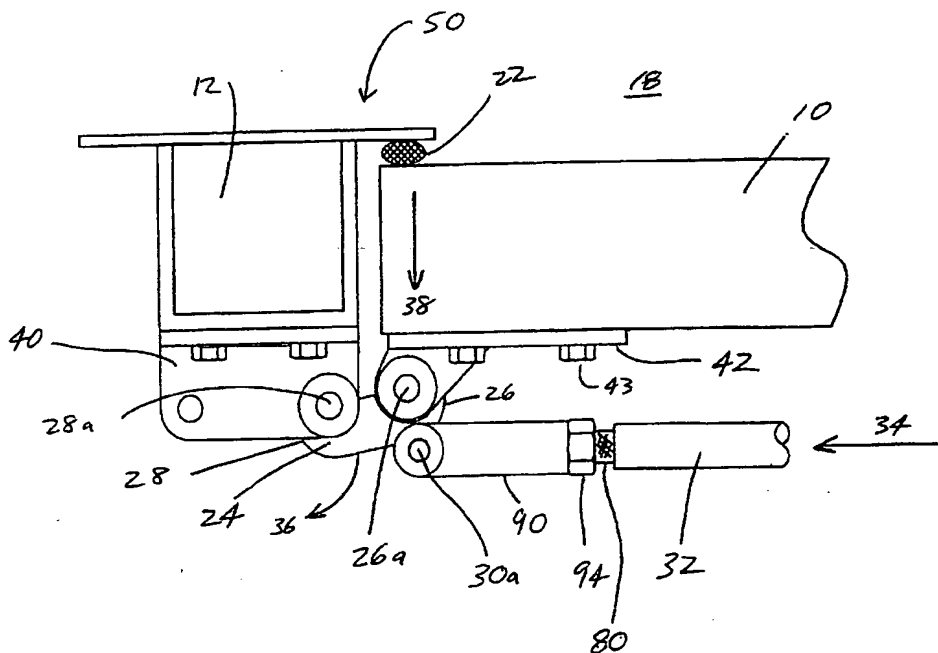
*seal
compression*

Different problem

No door edge pocket

(54) Titre : SYSTEME ARTICULE DE PORTE ET BLOC PORTE

(54) Title: ARTICULATING DOOR HINGE SYSTEM AND DOOR ASSEMBLY



(57) Abrégé/Abstract:

A door hinge system and door assembly allow a door in a wood veneer dryer to be pulled directly away from its associated door frame before being allowed to swing open in the normal fashion, thus reducing wear on the seal between the door and the door frame. The door assembly allows the tightness of the door to be easily adjusted without the need for shims, and allows the tightness to be adjusted even when the dryer is in operation.

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ARTICULATING DOOR HINGE SYSTEM AND DOOR ASSEMBLYTechnical Field

This invention relates to door hardware, and more particularly to hinges which allow a door to articulate outwardly from a door frame before being allowed to swing open.

Background

Many large, enclosed industrial structures have access doors along their lengths to allow workers to access the interior of the structure for monitoring, maintenance and repair purposes. One such enclosure which has a plurality of doors is a wood veneer dryer, which dries wood veneers by heat. The doors in a veneer dryer allow access to various portions of the machinery, including rollers, contained within the dryer.

Each of these doors in a veneer dryer requires a seal sandwiched between the door and the door frame, the seal affixed either to the door or to the corresponding door frame. Such a seal prevents air from being drawn into the dryer, thereby reducing the potential for a fire, and also prevents the hot, acrid air produced within the dryer from escaping from the dryer into the surrounding environment. Further, the seals are needed to properly maintain pressure differentials within portions of the dryer itself. It is thus important to maintain these seals in very good condition.

There are two significant problems with these seals in current veneer dryers. First, the doors in most veneer dryers are hinged to the door frames in a standard manner, i.e. by simple hinges which allow the doors to swing open in a typical fashion. This swinging action wears the door seals unevenly, and in particular, the portion of the seal closest to the hinged edge of the door wears

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quickly, as the door is opened and closed, relative to the other portions of the seal. Given the importance of these seals in a veneer dryer, the seals require constant monitoring and frequent replacement, costing the dryer operator money and lost time.

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Second, most portions of veneer dryers, which are generally made of metal, naturally expand significantly when hot, and contract when cold. The amount of expansion, of course, depends largely on the temperature reached in the dryer, and the material used in construction of the dryer. The door of a dryer may expand and contract at a different rate than the door frame to which it is attached. This alters the pressure on the seal sandwiched between the door and the door frame.

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An operator may try to compensate for this by trying to adjust the force exerted by the door against the door frame (ie. the door's tightness) to try to maintain a constant pressure on the seal between them. Currently, operators try to accomplish this by adding or removing shims between the hinges and the door and/or door frame. This is an inaccurate, time consuming procedure which cannot be done when the dryer is in operation.

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To limit the aforementioned uneven and premature wear on the door seals, therefore, it would be useful to provide an improved door hinge system which allows an operator to first move a veneer dryer door relatively straight out and away from the door frame before swinging the door open in a typical fashion. This would allow the door seal to wear relatively evenly, reducing the need for frequent replacement.

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Further, to make it possible to adjust the force exerted by the door against the door frame (ie. to adjust the pressure on the seal), it would be helpful to provide associated means for allowing a door to be tightened or loosened against its frame while it is in a closed position.

Summary of Invention

The present invention provides a door hinge system for attaching a door to a door frame. Most broadly, the invention comprises, in combination, a linkage having a first end pivotally connected to a door at a first pivot axis and a second end pivotally connected to the door frame at a second pivot axis; and an arm pivotally connected at a first end to the linkage at a third pivot axis further from the door than the plane between said first and second axes. In this manner, the door can be moved outwardly relative to the door frame by moving the rod longitudinally towards said linkage, and then swung open in a normal fashion.

While the linkage can be connected directly to the door, in a retrofittable version of the invention, the first pivot axis passes through a first hinge portion attached to the door and the second pivot axis passes through a second hinge portion attached to the door frame. The linkage is accordingly connected to both of said hinge portions.

The arm itself may have a u-shaped bracket pivotally connected to the linkage and a threaded arm portion threaded into a block provided in the u-shaped bracket for receiving the threaded arm portion. A locking nut threaded against the block may secure the threaded arm portion to the u-shaped bracket. When the arm is fixed at its second end, shortening it by threading the threaded arm portion

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further into the block pulls against the linkage, tightening the door against the door frame.

In a further embodiment of the invention, a latch assembly is provided to the door which, in combination with the aforementioned hinge system, makes up a door assembly for tightening the door against the door frame. In this assembly, the arm traverses the door and is connected at its second end to the latch assembly. The latch assembly has includes means for moving the arm from a first position pulling on the linkage to close the door to a second position pushing on the linkage to open the door. The arm can be shortened to tighten the door against the door frame (more particularly, against the seal sandwiched between the door and door frame), when the door is in a closed position. This can be accomplished by providing the arm with oppositely-threaded end portions and a central portion threaded onto each. Turning the central portion draws together, or forces apart, the ends of the arm.

Brief Description of Drawings

In drawings which illustrate specific embodiments of the invention, but which should not be construed as restricting the spirit or scope of the invention in any way:

Figure 1 is a schematic illustration of a veneer dryer, showing a plurality of access doors along one side thereof;

Figure 2A is a cross-sectional illustration of a typical prior art door/door frame arrangement in a veneer dryer, showing a door hinged to a door frame in the typical manner;

Figure 2B is an illustration of the door/door frame arrangement shown in Figure 2, showing the seal caught on the door as the door is being closed;

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Figure 3A is a cross-sectional illustration of a door/door frame arrangement made in accordance with the preferred embodiment of the articulating door hinge system of the present invention, with the door in a closed position.

5 Figure 3B is an illustration of the door/door frame arrangement shown in Figure 3A, with the door in a first position opened away from the door frame;

10 Figure 3C is an illustration of the door/door frame arrangement shown in Figure 3A, with the door in a second, fully opened position.

Figure 4 is a broken view of the components of the door hinge system shown in figure 3A;

Figure 5 is a perspective view of the assembled door hinge system shown in Figures 3A and 4;

15 Figure 6 is a broken view of the latch assembly of the door assembly of the present invention;

Figure 7 is a perspective view of the portion of the door assembly shown in Figure 6;

20 Figure 8 is a perspective view of the door assembly of the present invention; and

Figure 9 is a schematic view of a portion of the cross arm of the door assembly shown in Figure 8.

Description

25 The present invention relates primarily to doors used in a wood veneer dryer of the type shown in Figure 1, although the invention has application in any situation where a good seal must be maintained between a door and a door frame. Industrial freezer doors and smoke ovens are other examples where the invention might be
30 used. Reference is made hereafter to a veneer dryer only for the sake of example.

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In a veneer dryer, denoted generally hereafter by the numeral "100", a plurality of doors 10 is provided along the length thereof to allow workers to inspect and repair machinery (not shown) contained within dryer 100.

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In a typical dryer 100, doors 10 are simply hinged in the normal manner to door frames formed within the walls of dryer 100. As shown in Figure 2A, which illustrates a portion of a prior art door/door frame arrangement in cross section, door 10 is typically
10 hinged to door frame 12 by a standard hinge 14 having two hinge leaves 15a, 15b connected by a hinge pin 13. A seal 22 typically surrounds the door opening. As mentioned earlier, shims 17 may be placed between hinge 14 and door 10 or door frame 12 to adjust the "tightness" of door 10 against door frame 12.

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With this arrangement, door 10 opens in the direction of arrow 16, allowing access into the interior 18 of dryer 100. It will be seen from Figure 2A that this opening movement causes the backside of door 10 to move in the direction indicated by arrow 20, which tends
20 to pinch or crush a portion of seal 22 sandwiched between door 10 and door frame 12. As described earlier, repeated opening of door 10 tends to prematurely wear the portion of seal 22 which is so crushed.

Further, in such prior art system, once door 10 has been
25 opened, seal 22 typically expands, as shown in Figure 2B. When door 10 is closed again (in the direction of arrow 19), the backside edge of door 10 tends to "catch" seal 22, which is not desirable.

Figure 3A shows a similar view to Figure 2, but shows the
30 door hinge system of the present invention, denoted generally hereafter by the numeral "50".

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The system 50 of the present invention also has, in a preferred embodiment, a door 10 and a door frame 12 enclosing, together with the other outer portions of dryer 100, the interior 18 of dryer 100. Again, a seal 22 is sandwiched between door 10 and door frame 12 to prevent gases from entering, or escaping from, dryer 100.

System 50 also further has a hinge connecting door 10 to door frame 12. As shown in Figures 3A-5, however, in the present system door 10 is attached to door frame 12 by a linkage 24. Specifically, linkage 24 has a first end 26 pivotally connected to door 10 at a first pivot axis 26a and a second end 28 pivotally connected to door frame 12 at a second pivot axis 28a, conveniently with pins 29 (Figure 4), as shown. Pins 29 can be held in place in any convenient manner. In this arrangement, door 10 can pivot about axis 26a, relative to linkage 24, and the door/linkage combination can pivot about axis 28a, relative to door frame 12.

Apart from ends 26, 28, linkage 24 also has a third portion 30 (Figure 4) serving as a third pivot axis 30a to which is further pivotally connected one end of an arm 32, also with a pin 29. As shown in detail in Figure 4, in one embodiment of the invention, arm 32 has a u-shaped bracket 90 on its end, the middle portion of bracket 90 having a block 92 machined to accept the threaded end 80 of a rod. The significance of this arrangement is described in greater detail below.

It will be appreciated, as shown in Figures 3A-3C, that when pivot axis 30a occupies a space further outward of the door than the plane occupied by both the first and second axes, 26a, 28a, moving arm 32 along its longitudinal axis in the direction of arrow 34 (shown in Figure 3A) pushes against linkage 24 at axis 30a. With

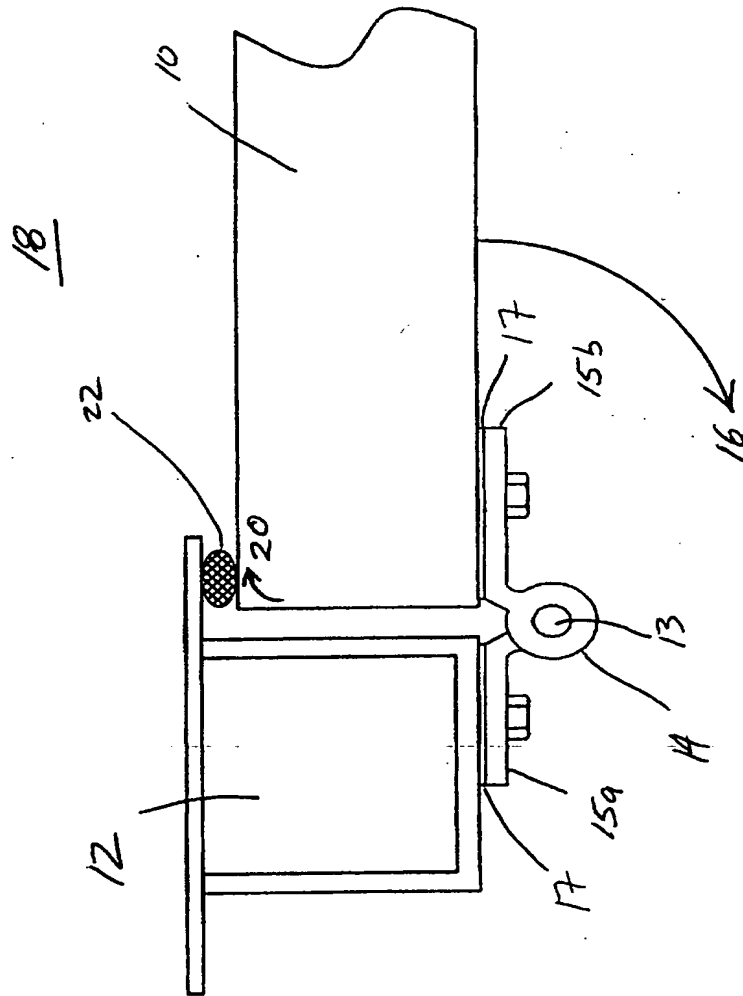
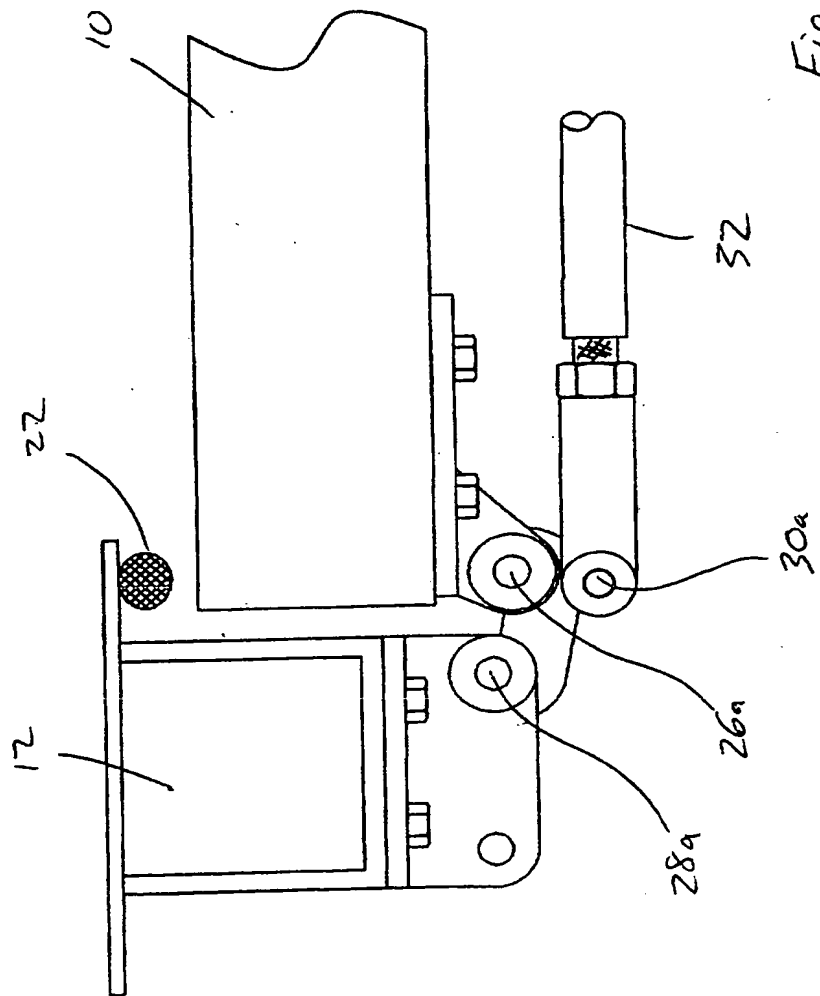


Fig. 2A (Prior Art)



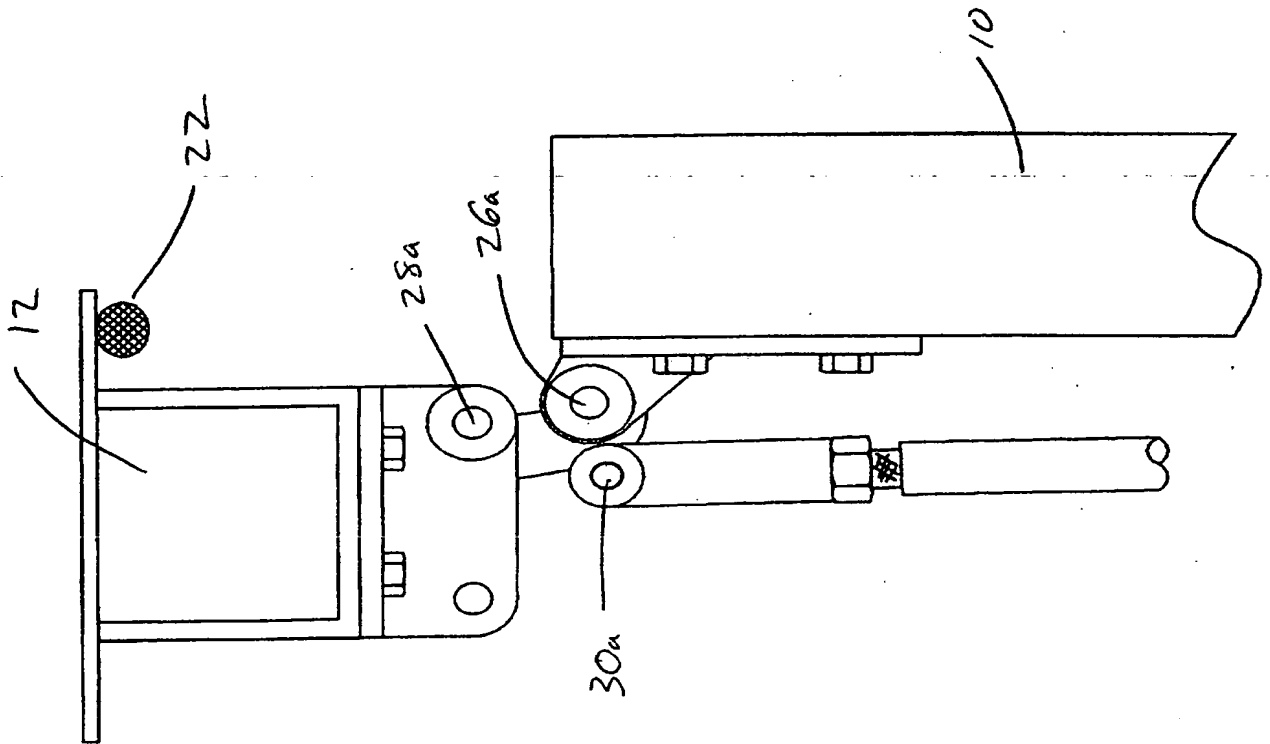


Fig. 3C